REMARKS

Claims 26, 28, 31, 33, 35, and 37 have been amended. Claims 27, 32, and 36 have been canceled. Claims 26, 28-31, 33-35, and 37-48 are now pending. The Title of the Invention has been amended to correspond more closely to the pending claims. No new matter has been added. Applicants reserve the right to pursue the original claims and other claims in this and other applications. Applicants respectfully request reconsideration of the above-referenced application in light of the amendments and following remarks.

Claims 26, 31, 35, 39-41, 43, and 46 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. patent no.: 6,348,365 ("Moore"). The rejection is respectfully traversed.

Moore does not disclose a method comprising, *inter alia*, "forming a first conductive electrode . . . forming a chalcogenide comprising material . . . forming a metal-containing layer over the chalcogenide comprising material; diffusing at least a portion of said metal-containing layer into said chalcogenide comprising material . . . [which] forms a rough outer surface on said chalcogenide comprising material; exposing a portion of said rough outer surface to an iodine comprising fluid that reduces the roughness of said outer surface by etching away at least a portion of said rough outer surface; and forming a second conductive electrode material," as recited in claim 26.

Moore does not teach a method comprising, *inter alia*, "forming a chalcogenide glass layer; forming a metal-containing layer . . . forming a rough outer surface on at least a portion of said chalcogenide glass layer by diffusing at least a portion of said metal-containing layer into said chalcogenide glass layer . . . and, smoothing said rough outer surface with an iodine comprising fluid that removes at

least a portion of said rough outer surface," as recited in claim 31.

Similarly, Moore does not teach a method comprising, *inter alia*, "forming a semiconductor substrate; forming a first dielectric layer . . . forming a first conductive layer . . . forming a second dielectric layer . . . forming an opening in at least a portion of said second dielectric layer, wherein at least a portion of said first conductive layer is exposed; forming a chalcogenide glass layer . . . forming a metal-containing layer . . . diffusing at least a portion of said metal-containing layer into said chalcogenide glass layer, wherein said step of diffusing forms a rough outer surface on said chalcogenide glass layer; removing at least a portion of said rough outer surface with an iodine comprising fluid to form a smoother surface; and, forming a second conductive layer," as recited in claim 35.

Moore does not disclose exposing a portion of a metal layer to an *iodine comprising* fluid that reduces the roughness of the outer metal layer's surface by etching away or smoothing at least a portion of the rough outer surface. In other words, Moore merely describes a conventionally formed programmable cell. For example, in Moore, "metal material layer 41 is *planarized* back to the top surface of dielectric material 13, leaving a residual layer of metal material 41 on top of recessed glass material 31." (Col. 3, lines 21-24). Moore merely discloses that the metal material layer 41 is planarized and *not* exposed to an iodine comprising fluid that reduces the roughness of an outer surface.

In forming programmable memory cells, as described in Moore, a layer of silver was formed on a resistance variable material and irradiated. (*See also* Applicants' specification, Background, pg. 2 through pg. 3). The applied energy from the irradiation resulted in silver which migrated into the glass layer. (*See also* Applicants' specification, Background, pg. 3). The surface of the metal layer could have

"semicircular nodules or bumps anywhere from 50 Angstroms to 20 microns across." (Applicants' specification, Background, pg. 3). A top electrode would be deposited; but, the bumps could create voids to the doped glass through the electrode material, thereby partially exposing the doped glass. Photodeveloper solutions used to pattern the top electrode could then etch the exposed glass leading to undesirable results.

Applicants discovered that exposing the rough outer surface on the chalcogenide material to an iodine comprising solution, substantially removed the bumps and semicircular nodules, thus avoiding potential problems experienced in forming prior art structures. Since Moore merely planarizes metal layer 41 and does not disclose the use of an iodine comprising fluid, the semicircular nodules and bumps could still be present. Applicants claimed method *etches* away and smoothes the semicircular nodules and bumps and does not merely *planarize* a metal layer as Moore describes.

Thus, Moore does not disclose "exposing a portion of [a] rough outer surface to an *iodine comprising fluid* that reduces the roughness of [the] outer surface by *etching away* at least a portion of [the] rough outer surface," as recited in claim 26, or "*smoothing* [a] rough outer surface with an iodine comprising fluid that *removes* at least a portion of [the] rough outer surface," as recited in claim 31, or "*removing* at least a portion of [a] rough outer surface with an iodine comprising fluid to form a *smoother* surface," as recited in claim 35.

Claims 39-41, 43, and 46 depend from claim 35 and should be allowable along with claim 35 for at least the reasons provided above, and on their own merits.

Claims 26, 30, 31, 35, 39-43, and 46-48 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. patent no.: 6,487,106 ("Kozicki"). The rejection is respectfully traversed.

Kozicki does not disclose "exposing a portion of [a] rough outer surface to an *iodine comprising fluid* that reduces the roughness of [the] outer surface by *etching away* at least a portion of [the] rough outer surface," as recited in claim 26, or "*smoothing* [a] rough outer surface with an *iodine comprising fluid* that removes at least a portion of [the] rough outer surface," as recited in claim 31, or "*removing* at least a portion of [a] rough outer surface with an *iodine comprising fluid* to form a smoother surface," as recited in claim 35.

The Office Action asserts that Kozicki discloses "removing at least a portion of rough outer surface to form a smoother surface by chemical mechanical planarization (CMP)," (Office Action, pg. 3), and cites Kozicki's Col. 6, line 62 through Col. 7, line 4 for support. Kozicki's col. 6, line 62 through col. 7, line 4, however, does not support the Office Action's assertion. Kozicki merely discloses that ion conductor 140 and electrode 120 material can be formed within a via (FIG. 1). When "non-selective deposition methods are used, *any excess material remaining on a surface of insulating layer 150 may be removed,* using, for example, chemical mechanical polishing and/or etching techniques." (Col. 7, lines 1-4) (emphasis added). In other words, Kozicki only discloses removing excess material from the *surface of insulating layer 150.* Kozicki does *not* disclose that ion conductor 140 or electrode 120 undergoes chemical mechanical polishing or etching as the Office Action asserts.

As a result, Kozicki does not disclose a method comprising, *inter alia,* "forming a first conductive electrode . . . forming a chalcogenide comprising material . . . forming a metal-containing layer over the chalcogenide comprising material;

diffusing at least a portion of said metal-containing layer into said chalcogenide comprising material . . . [which] forms a rough outer surface on said chalcogenide comprising material; exposing a portion of said rough outer surface to an iodine comprising fluid that reduces the roughness of said outer surface by etching away at least a portion of said rough outer surface; and forming a second conductive electrode material," as recited in claim 26.

Kozicki does not teach a method comprising, *inter alia*, "forming a chalcogenide glass layer; forming a metal-containing layer . . . forming a rough outer surface on at least a portion of said chalcogenide glass layer by diffusing at least a portion of said metal-containing layer into said chalcogenide glass layer . . . and, smoothing said rough outer surface with an iodine comprising fluid that removes at least a portion of said rough outer surface," as recited in claim 31.

Similarly, Kozicki does not teach a method comprising, *inter alia*, "forming a semiconductor substrate; forming a first dielectric layer . . . forming a first conductive layer . . . forming a second dielectric layer . . . forming an opening in at least a portion of said second dielectric layer, wherein at least a portion of said first conductive layer is exposed; forming a chalcogenide glass layer . . . forming a metal-containing layer . . . diffusing at least a portion of said metal-containing layer into said chalcogenide glass layer, wherein said step of diffusing forms a rough outer surface on said chalcogenide glass layer; removing at least a portion of said rough outer surface with an iodine comprising fluid to form a smoother surface; and, forming a second conductive layer," as recited in claim 35.

Claim 30 depends from claim 26. Claims 39-43 and 46-48 depend from claim 35. These dependent claims should be allowable along with their base independent claim for at least the reasons provided above, and on their own merits.

Claims 27-28, 32-33, and 36-37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kozicki in view of U.S. patent no.: 5,972,792 ("Hudson"). The rejection is respectfully traversed.

For similar reasons provided above, Kozicki does not disclose "exposing a portion of [a] rough outer surface to an *iodine comprising fluid* that reduces the roughness of [the] outer surface by *etching away* at least a portion of [the] rough outer surface," as recited in claim 26, or "*smoothing* [a] rough outer surface with an *iodine comprising fluid* that removes at least a portion of [the] rough outer surface," as recited in claim 31, or "*removing* at least a portion of [a] rough outer surface with an *iodine comprising fluid* to form a smoother surface," as recited in claim 35.

Hudson is relied upon for disclosing the use of an iodine solution for chemical planarization and adds nothing to rectify the deficiencies of Kozicki. Namely, Kozicki only discloses removing excess material from the *surface of insulating layer 150*. Kozicki does *not* disclose that ion conductor 140 undergoes chemical mechanical polishing or etching.

Moreover, there is no motivation to combine the two references since the two references teach different methods when employing different metals. For example, Hudson discloses using a potassium iodate solution *only* to planarize a conductive layer of *aluminum*. (Col. 4, lines 52-56). "To planarize a conductive layer of aluminum from the front face 14 of the wafer 12, the planarizing solution . . . [can comprise] potassium iodate." (Col. 4, lines 54-56). When it is a conductive layer of copper, Hudson discloses using a different combination, none of which include potassium iodate. (Col. 4, lines 57-65). In Kozicki, ion conductor 140 is disclosed as comprising *silver*. (Col. 5, lines 53-63). Thus, there is no motivation to use Hudson's potassium iodate solution since Kozicki's ion conductor 140 does not comprise aluminum.

"The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." M.P.E.P. § 2143.01. The prior art is *not* suggesting the proposed combination; but, rather the claimed invention is the foundation for the combination. As noted above, the references teach away from each other by disclosing different metals. The proposed combination is improper hindsight reconstruction. This fact is underscored by Kozicki's disclosure that *only* the surface of insulating layer 150 is planarized.

Claims 29, 34, and 38 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kozicki in view of Hudson. The rejection is respectfully traversed.

For similar reasons provided above, there is no motivation to combine the two references since Kozicki uses silver for ion conductor 140. Hudson discloses the use of potassium iodate *only* when aluminum comprises a conductive layer. Further, Kozicki discloses that *only* the surface of *insulating layer 150* undergoes a chemical mechanical polishing step.

As such, the cited references do not teach or suggest "exposing a portion of [a] rough outer surface to an *iodine comprising fluid* that reduces the roughness of [the] outer surface by *etching away* at least a portion of [the] rough outer surface," as recited in claim 26, or "*smoothing* [a] rough outer surface with an *iodine comprising fluid* that removes at least a portion of [the] rough outer surface," as recited in claim 31, or "*removing* at least a portion of [a] rough outer surface with an *iodine comprising fluid* to form a smoother surface," as recited in claim 35.

The Office Action asserts that it would have been obvious to modify Hudson's potassium iodate solution to arrive at Applicants' claimed potassium iodide concentrations. Applicants respectfully submit, however, that this is not the standard for setting forth a *prima facie* case of obviousness. "To establish *prima facie* obviousness of a claimed invention, *all* the claim limitations must be taught or suggested by the prior art." M.P.E.P. § 2143.03 (emphasis added). In this case, Hudson does not teach or suggest *any* composition for a potassium iodate solution. As indicated previously, Hudson merely discloses that potassium iodate can be used *only* when a conductive layer of aluminum undergoes CMP. However, no composition is given, in Hudson, regarding potassium iodate.

As such, the cited references do not disclose a "potassium iodide solution [which] comprises from 5 to 30 grams of I_2 per 1 liter of a from 20% to 50% by volume potassium iodide solution," as recited in claims 29, 34 and 38. These are additional reasons for the allowance of dependent claims 29, 34, and 38.

Claims 44 and 45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kozicki. The rejection is respectfully traversed.

Claims 44 and 45 depend from claim 35 and should be similarly allowable along with claim 35 for at least the reasons provided above, and on their own merits. Namely, Kozicki does not disclose or suggest "*removing* at least a portion of [a] rough outer surface with an *iodine comprising fluid* to form a smoother surface," as recited in claim 35. As the Office Action acknowledges, Kozicki does *not* disclose the use of an iodine comprising fluid to make a smoother surface.

The Office Action asserts that the specific thicknesses of the metal-containing layer and conductive layer is a well known processing variable and is obvious involving routine skill in the art. Applicants respectfully submit, again, that this is not the standard for setting forth a *prima facie* case of obviousness. "To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." M.P.E.P. § 2143.03. In this case, Kozicki does not teach or suggest *any* thicknesses for a metal-containing layer or conductive layer.

As such, Kozicki does not disclose or suggest a "metal-containing layer [which] is formed to be less than or equal to 200 Å thick," as recited in claim 44, or a "second conductive layer [which] is formed from about 140 Å to about 200 Å thick," as recited in claim 45. These are additional reasons for the allowance of dependent claims 44 and 45.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to review and pass this application to issue.

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Respectfully submitted,

By_____

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